MAGNETIC PROPERTIES OF CARBON-COATED PERMALLOY FILMS

Chlenova A.A.[(1)], Novoselova Iu.P.[(2)], Salikhov R.[(2)], Farle M.[(2)], Kurlyandskaya G.V.[(1)]
[(1)] Ural Federal University
620002, Ekaterinburg, Mira st. 19, Russia
[(2)] University of Duisburg-Essen
47057, Duisburg, Lotharstrasse st. 1, Germany

Low-temperature condensation of carbon from an aromatic solvent (toluene) under normal conditions [1] is promising for protective or functional coating. Ferromagnetic resonance (FMR) is the selective absorption of the energy of an external microwave field by a ferromagnet. It is considered to be an effective method for determination the dynamic contribution of the magnetic permeability and evaluation of the homogeneity of the ferromagnetic sample. Thin films of Fe19Ni81 (Py) composition, a magnetically soft material widely used for sensitive elements of external magnetic field detectors, have been studied in this work. Py 100 nm thick films were deposited by magnetron sputtering onto glass substrates. Control group samples were left in air, and other samples were placed into toluene for 18 days. The FMR spectrum of an unmodified sample showed one resonance, and the toluene modified sample showed several resonance fields H_{res} (see Figure, c) suggesting the formation of at least two magnetic contributions. The first one is due to Py, and the second one corresponds to Py at the interface with the carbon layer. Such an effect can be qualitatively explained by the mechanism of deposition (and incorporation of carbon on the surface of 3d metals by the Sholl reaction type, which includes the oxidation stage of Fe and Ni [1].

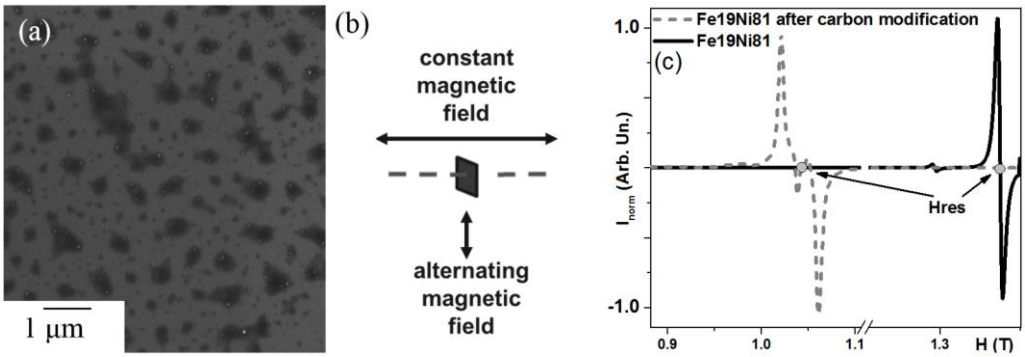

Image of the surface of Py after modification in toluene from scanning electron microscopy (a); position of the sample when the FMR spectra are measured (b); FMR spectrum before and after modification (c)

1. Beketov I.V. et. al. // J. Analit. Chem. 2013. V. 586(1). P. 483.

This work is supported by the German-Russian Interdisciplinary Science Center (G-RISC) funded by the German Federal Foreign Office via the German Academic Exchange Service (DAAD).